METHOD AND SYSTEM OF ZOOMING DIGITAL IMAGES

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This present invention relates generally to a method and system of image display, and more particularly to a method and system of marking the position of image display and zooming ratio of image in accordance with the index or cursor.

2. DESCRIPTION OF THE PRIOR ART

In the field of image display, it usually requires displaying image information with a specific zooming ratio in a picture. This kind of application is usually bundled with some software or hardware, for instance image editing software or zooming digital images of digital camera.

In prior art, this kind of application usually takes the image position where image information is located at the center of display area as a position base, for instance pixels. After zooming the original image information with a specific zooming ratio, it renews a zoomed image according to the position base that is located at the center of display area. Since when the zooming ratio is changed, new image should be larger or smaller than the original display range; accordingly, users should shift the picture so that the image

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intended can be displayed in a display area. As a result, it will expend a lot of computing cost. First, in step 110, which is shown in FIG.1, acquiring a zooming ratio and a position base, wherein acquiring method of the zooming ratio can be in many ways. For instance, acquiring by choosing one from default zooming ratios, increasing zooming ratio directly in proportion to a default zooming ratio or inputting by users. While the position base is generally acquired by the position in display information according to the central or upper left-hand corner of the display area (for instance, position of 1st pixel in the display area). Next, in step 120, renewing a zoomed image in the display area according to the zooming ratio. And next, in step 130, displaying the zoomed image in the display area according to the position base. Finally, in step 140, shifting the zoomed image continuously until the display area displays parts of images intended.

As the method described above, it renews a zoomed image after the whole image information is zoomed in accordance with the zooming ratio. When the image information is very huge, some shortcomings will occur as the following. First, image is usually saved in a frame buffer before outputting that; thus, it requires a large frame buffer when using the method of prior art. Moreover, only part of the frame buffer is used for displaying in the display area, but otherwise frame buffer leaves unused. Besides, each time when image is shifted, it requires acquiring again part of the image for displaying in the display area from the frame buffer; accordingly

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it requires a lot of computing cost. Furthermore, we cannot anticipate the image display that is after shifting before it is shifted, so that it requires shifting continuously until it is appropriate. Each shift requires additional electric power and time, so if it is applied to portable devices (for instance, digital camera) taking account of costs and electric power, the cost of hardware and use of electric cell become uneconomical.

Evidently, the method of shifting image continuously after the image is zoomed in accordance with zooming ratio is uneconomical. Therefore, it requires providing portable devices with a more economical method or system.

SUMMARY OF THE INVENTION

According to the requirements described above, one main objective of the present invention is to provide a method and system of zooming digital images according to a specific zooming ratio by a single coordinate. It's convenient to users when choosing parts of images in the display area arbitrarily and then renewing a zoomed image after zooming in or zooming out.

Besides, it is another objective of the present invention to provide a method and system of zooming image by a plurality of coordinates, wherein acquiring a position base and a zooming ratio in the way of selecting two coordinates by users or marking a

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range. It's convenient to users when choosing parts of images in the display area arbitrarily, and then renewing a zoomed image after zooming in or zooming out.

According to the objectives described above, the present invention provides a method of marking position and zooming images according to a single coordinate. It is used to mark a position base according to the index and conform to a zooming ratio; accordingly it renews a zoomed image in the display area according to the position base and the zooming ratio.

The present invention also provides a method of marking position and zooming images according to a plurality of coordinates. It is used to mark two coordinates by the index for acquiring a position base and a zooming ratio; accordingly the display area renews with a zoomed image according to the position base and the zooming ratio.

The present invention also provides a system of marking position and zooming images, comprising an image memory configured for saving image information, an interface means configured for producing a position base (which is a specific position of the image information) and a zooming ratio, an image processing unit configured for renewing a zoomed image in the display area according to the position base and the zooming ratio and a display means configured for displaying image in the display area.

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Since it anticipates that the picture renews in original picture, so that it doesn't require shifting the picture continuously. Therefore, it saves a lot of computing cost and frame buffer cost.

BRIEF DESCRIPTION OF THE DRWAING

The present invention can be best understood through the following description and accompanying drawings, wherein:

FIG.1 schematically shows the flow chart of prior art;

FIG.2 schematically shows the flow chart of one embodiment of the present invention;

FIG.3 schematically shows the flow chart of one embodiment of the present invention; and

FIG.4 schematically shows the block diagram of another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Some appropriate and preferred embodiments of the present invention will now be described in the following. It should be noted, however, that the embodiment is merely an example and can be variously modified without departing from the range of the present invention.

It is to be understood, however, that the drawings, which are not to scale, are designed for the purpose of illustration and not as a definition of the limits of the invention, for which reference

should be made to the appended claims.

In prior art, when zooming images usually a picture is zoomed and shifted; therefore it requires a larger frame buffer and a lot of computing cost. As a result, main characteristic of the present invention is to mark the position base displayed actually in a picture first and then calculate a new picture by using the position base according to a zooming ratio (default or adjusted by users). Accordingly it renews a zoomed image in display area (for instance, LCD panel or OLED panel). Therefore, in the process of zooming images, it doesn't require shifting picture continuously so that it saves a lot of computing cost. Since it doesn't require shifting picture continuously and zooming the whole image information for shifting so that it only requires zooming part of the image needful to a new picture for producing a zoomed image; thus, it saves unnecessary frame buffer. Besides, it can also produce the pixels of new zoomed images in turn and then outputting that to the display area; thus it doesn't require a frame buffer.

Therefore, one embodiment of the present invention is the method of zooming digital images with a single coordinate. FIG. 2A schematically shows the flow chart of one embodiment of the present invention. First in step 210, displaying image in the display area, wherein the image can be displayed according to format of the image information after acquiring the image information from digital images capture means. And the image information can be saved in different storage media (for instance, disk, flash card or

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memory) with different formats (for instance, pixels or files). Format of the image information and storage method of the present invention is not restricted. Besides, the image displayed in the display area can be presented merely with part of the captured image information or be presented with the whole image information. The range presented by the captured image information in the display area of the present invention is not restricted. The block 2100 in FIG. 2B schematically shows the diagram according to step 210.

Next, in step 220, acquiring a position base of the image information, wherein the position base is acquired according to the image information relative to a coordinate of the display area. In other words, taking the relative position of the coordinate in the image information presented in the display area as the position base. For instance, shifting the index (for instance, cursor) to the coordinate and then acquiring the position base; otherwise, inputting coordinate by users for acquiring the coordinate of the position base. The coordinate of the position base is the relative position in the image information to the coordinate; in other words, finding which is used in the image information for displaying in the coordinate, wherein the relative position can be a relative coordinate or a position of pixels. Acquiring method of the position base and representation method of the relative position of the present invention is not restricted. Besides, in step 220, acquiring a coordinate of central position of the display area in the meanwhile so as to be a reference coordinate point when renewing a

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zoomed image. The block 2200 in FIG.2B is the diagram of step 220.

In the following, in step 220, acquiring a position base according to the relative position of the cursor location, and then acquiring a zooming ratio according to step 230. Acquiring method of the zooming ratio can be in many ways, for instance acquiring by choosing one from default zooming ratios, increasing zooming ratio in proportion to a default zooming ratio or inputting directly by users; thus, acquiring method of the zooming ratio of the present invention is not restricted.

Finally, as is shown in step 240, using the image information to renew a zoomed image in the display area according to the position base and the zooming ratio; otherwise, referring to coordinate of the central position and then renewing a zoomed image in the display area. And image display is to take the position base of the cursor location as a marked point, wherein the marked point can be any specific position in the display area. For instance, the specific position can be center of the display area, one of four corners of the display area (i.e. upper left-hand, upper right-hand, lower left-hand and lower right-hand) or other position, which is not restricted in the present invention. Next, the display area renews with a zoomed image according to the zooming ratio. Besides, the renewed image can be zooming in and zooming out according to the default zooming ratio or increasing (decreasing) the zooming ratio in proportion to the default zooming ratio directly. Moreover, size of

the zoomed image can merely conform to the display area (i.e. merely using part of image information for renewing an image) and it can exceed range of the display area (i.e. using the whole image information for renewing an image). It can also refer to coordinate of the central position and then renewing a zoomed image in the display area. And size of the image is not restricted in the present invention. The former method can save cost of frame buffer and it even doesn't require frame buffer while renewing image in the display area directly. And the latter method can save time of image shifting of users while expending a lot of computing cost (for instance, electric power); thus it requires a large frame buffer. The block 2300 in FIG.2B is the diagram of result after processing according to step 240. Accordingly, the embodiment not only comprises the function of image shift in prior art, but also makes choosing of images more convenient, time-saving and effort-saving to users.

It is another embodiment of the present invention to provide a method of zooming image by a plurality of coordinates, and FIG.3A schematically shows the flow chart of this embodiment. The difference between this embodiment and previous embodiment is that step 220 and step 230 in FIG.2A is replaced respectively by step 320 and step 330 of this embodiment. In step 320, acquiring a 1st coordinate 3310 (shown in FIG.3B) and a 2nd coordinate (shown in FIG.3B). Acquiring method of the 1st coordinate and the 2nd coordinate can be inputted by users or shifting a cursor presented in the display area in sequence to position of the 1st coordinate and

the 2nd coordinate by users for acquiring range or area of a coordinate.

Acquiring method of the 1st coordinate and the 2nd coordinate described above can be treated as marking a range of the display area or acquiring the 1st coordinate and the 2nd coordinate by marking a range of the display area. For instance, using the way marking a rectangle in the display area, which is as shown in 3210 of FIG. 3B. First, controlling the index marked at the 1st coordinate 3110. Next, in the meantime of shifting the index, displaying a rectangular frame line 3210 taking the 1st coordinate and location of the index as two endpoints of diagonal line in the display area and it is used for displaying the marked range. Otherwise, directly controlling the index to mark the 1st coordinate 3110 and the 2nd coordinate 3120 respectively in sequence and then producing the rectangular frame line 3210 taking the two coordinates as two endpoints of diagonal line. Similarly, the marked range is not restricted to rectangle only. It can also be a circle, which is produced by taking the 1st coordinate and the 2nd coordinate as two endpoints of diameter. And it can also be an ellipse, which is produced by taking the coordinate and the 2nd coordinate as the major axis and the minor axis according to aspect ratio of the display area.

In the following, in step 330, calculating a zooming ratio and a position base according to size of the marked range by the 1st coordinate 3110 and the 2nd coordinate 3120. The position base can

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be acquired by choosing one between the 1st coordinate and the 2nd coordinate or central point 3130 (which is as shown in FIG.3B) of the marked range by the two coordinates. And the zooming ratio can be acquired by the ratio according to the perpendicular width of the display area relative to the perpendicular distance between the 1st coordinate and the 2nd coordinate. Otherwise, it can be acquired by the ratio according to the horizontal width of the display area relative to the horizontal distance between the 1st coordinate and the 2nd coordinate.

And finally, as is described in step 240, using the image information to renew a zoomed image according to the position base and the zooming ratio. And detail of this embodiment is similar with the previous one; therefore it is not included in the following description.

According to the method disclosed above, it is another embodiment of the present invention to provide a system of zooming digital images, which is as shown in FIG. 4. And it comprises an image memory unit 31, an interface unit 32, an image processing unit 33, a display unit 34 and a temporal storage unit 35, wherein the image memory unit 31 is configured for recording image information 312. The image is produced according to step 210 described above. It is produced by the image processing unit 33 according to the image information 312 and then being displayed by the display unit 34, wherein the image produced can be saved in the temporal storage unit 35. Thus, the temporal storage unit 35

comprises a frame buffer for saving images and providing the display unit 34 for displaying.

Besides, the image processing unit 33 further comprises adding an index coordinate 352 in images. A coordinate position is produced relatively to location of the index and data of the coordinate can be saved in the temporal storage unit 35. In the meanwhile, it can also change the index coordinate 352 by the interface unit 32 for controlling location of the index, wherein the index coordinate 352 can be defined as the position that the index displayed in the display area 342. Otherwise, it can be defined as location of the index that part of the image information 312 displayed in the display area 342. For instance, position of a pixel in the image information 312 and position of the pixel is displayed in location of the index.

Besides, the interface unit 32 is further used to produce a position base 354 and a zooming ratio 356 according to step 220 and step 230 described above, wherein the position base 354 is a specific position in the image information 312. Acquiring method of the position base can be inputting coordinate by users for acquiring the coordinate of position base or shifting the index to the specific position and then acquiring the position base according to the index coordinate 352. It can also be another way for acquiring the specific position in image information 312 according to coordinate. And the position base 354 and the zooming ratio 356 can be saved in the temporal storage unit 35; thus the temporal storage unit 35

comprises a plurality of temporal storages, configured for saving the index coordinate 352, the position base 354 and the zooming ratio 356 described above.

Moreover, the interface unit 32 can acquire a 1st coordinate 3110 and a 2nd coordinate 3120 according to step 320 and step 330 described above and acquire the position base 354 and the zooming ratio 356 according to the two coordinates. Thus, the interface unit 32 further comprises an option, configured for choosing acquiring method of the zooming ratio 356 (for instance, to input by users, to choose one from default zooming ratios 356 or to acquire according to the 1st coordinate and the 2nd coordinate). It is therefore that the image processing unit 33 uses the image information 312 to renew a zoomed image in the display area 342 according to the position base 354 and the zooming ratio 356, which is as shown in step 240 described above. And detail of this embodiment is similar with the previous one; therefore it is not included in the following description.

The present invention can be applied to the system of position and display, as regards display of index is not the essential condition. For instance, the position base described above or coordinate can be acquired by touch screen when applying to the system of touch screen. In the system of touch screen, the index can be displayed in screen or not displayed in screen. Besides, the present invention can also be applied to portable devices, such as digital camera or mobile telephone.

While this invention has been described with reference to illustrative embodiments, this description does not intend or construe in a limiting sense. Various modifications and combinations of the illustrative embodiments, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to the description. It is therefore intended that the appended claims encompass any such modifications or embodiments.